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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/081,016	02/19/2002	Xu Wang		1228

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XU WANG  
17890 CASTLETON STREET, #369  
CITY OF INDUSTRY, CA 91748

2  
EXAMINER

MEEKS, TIMOTHY HOWARD

ART UNIT	PAPER NUMBER
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1762

DATE MAILED: 08/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.



**Office Action Summary**

Application No.

10/081,016

Applicant(s)

WANG ET AL.

Examiner

Timothy H. Meeks

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 and 2 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 and 2 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .



## DETAILED ACTION

### *Specification*

The disclosure is objected to because of the following informalities: The specification is replete with grammatical errors. It is requested that applicants thoroughly review the specification and correct all grammatical errors. For example, the verb tense is incorrect in many instances and definite articles ("the", "a", for example) is omitted prior to nouns. For example, in the first sentence, ".....plasma sulfurization of workpiece in vacuum, particularly to a process, wherein surface of workpieces made of ferrous metal, e.g., steel, is subjected to sulfurization treatment in vacuum at a lower working temperature bellow 400 °C....." should be ".....plasma sulfurization of workpieces in a vacuum, particularly to a process, wherein surfaces of workpieces made of ferrous metal, e.g., steel, are subjected to a sulfurization treatment in a vacuum at a low working temperature below 400 °C....."

Appropriate correction is required.

### *Claim Objections*

Claim 1 is objected to because of the following informalities: The same grammatical errors described in the specification are found in claim 1. It is suggested that the following grammatical changes be made to claim 1. Appropriate correction is required.

1. A process for sulfurization of workpieces in a vacuum, including cleaning the surface of the workpieces, loading the workpieces into a vacuum chamber, vacuum pumping, heating the sulfur source for sublimation thereof, making the gaseous sulfur ionized in the presence of a high electrical field and sulfurizing the workpieces,



Art Unit: 1762

removing the workpieces from the vacuum chamber, wherein after the workpieces [being] are cleaned, [putting them] the workpieces are placed into the vacuum chamber that has a pressure-rising rate up to  $10^{-3}$  Pa/h and [a] an ultimate vacuum up to 0.1 Pa, vacuuming to 20 to 100 Pa; heating the workpieces placed on the cathode plate at 35 to 120 °C for 20 to 40 min while keeping a [vacuity] vacuum of 0.1 to 1 Pa for desorbing the substances adsorbed on the surface of the workpieces to make the surface activated; in a direct current electric field of 800 to 1000 V, while keeping the same temperature as above-mentioned, ionizing the gaseous sulfur into positive sulfur ions and forming sulfur plasma; directly effecting sulfurization for 1 to 30 min; and finally charging [a] an inert or reductive gas into the vacuum chamber to cool the workpieces and then removing the workpieces from the chamber.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1 and 2 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 1, line 3, "the sulfur source" lacks proper antecedent basis in that no sulfur source was previously defined. The phrase should be changed to "a sulfur source". At lines 6-7, the phrase "vacuum chamber that has a pressure-rising rate up to  $10^{-3}$  Pa/h and a ultimate vacuum up to 0.1 Pa" is confusing. does this mean that the pressure of the chamber is required to raise at a rate within the range of up to  $10^{-3}$  Pa/h and be decreased to 0.1 Pa at this rate? Is the



Art Unit: 1762

chamber only required to have these capabilities, i.e., the chamber must have the capability of having its pressure raised at no more than  $10^{-3}$  Pa/h? Or does this phrase only mean that at any point in the process, the pressure in the chamber does not rise more than  $10^{-3}$  Pa/h? The specification provides no clarification as to the meaning of this phrase as it is only described in similar terms and no example is provided to illustrate the proper meaning or interpretation of this phrase. The examiner has assumed all of the meanings above in searching the prior art. At line 7, the phrase "vacuuming to 20 to 100 Pa" is confusing because it is not stated what is vacuumed or when the vacuuming is performed in the process. The next step requires maintaining a vacuum of 0.1 to 1 Pa (the heating step). Is it merely required that at some point, the vacuum chamber has a vacuum in the range of 20 to 100 Pa? What is performed during this pressure requirement? In the third to last line, it is not defined exactly what is sulfurized. The examiner suggests inserting "of the workpieces" after "sulfurization" at line 13 if this is what is intended by applicants.

In claim 2, it is unclear how "a step for coating molybdenum disulfide of nanometer grade" relates to the process of claim 1. Is molybdenum disulfide coated with another layer or is molybdenum disulfide coated onto the workpieces of claim 1 at some point?

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP 218916 in view of JP 51-49138 and FR 2688010.

EP 218916 discloses a process for sulfurizing metal workpieces to improve their resistance to wear and seizure by improving lubrication properties comprising placing the parts on a cathode in a vacuum chamber, evacuating the chamber to about  $10^{-2}$  Torr (which is approximately equal to 1 Pa) heating a solid sulfur source contained in the chamber to sublime it and applying direct current voltage of 450 to 1500 V to ionize the gaseous sulfur, and sulfurizing the parts for 1 to 4 hours while heating them to between 140 to 300 °C and maintaining the chamber at about 1 Torr (200 Pa in the claim converts to about 0.75 Torr which can be considered to be within the disclosed pressure of about 1 Torr) (col. 1, lines 10-15; col. 3, lines 15-20; col. 4, lines 5-52).

EP 218916 does not explicitly disclose cleaning the parts prior to placing them into the chamber or heating the part at 35 to 120 °C for 20 to 40 minutes at the claimed temperature to desorb substances adsorbed on the surfaces of the workpieces. However, because FR 2688010



Art Unit: 1762

discloses that cleaning metallic parts before introducing into a chamber for sulphiding removes oil and grease (page 5, lines 20-25) and that purging the chamber with the parts therein at ambient temperature which can include 35 °C and low pressure removes oxygen (page 5, lines 25-34), it would have been obvious to have performed such treatments to remove oils and grease from the workpieces before coating and to remove oxygen contaminant.

EP 218916 discloses to treat the parts for 1 to 4 hrs which is longer than the claimed range of 1 to 30 minutes. However, because JP 51-49138 discloses that a treatment time of 10 minutes is operable for sulphiding metal parts to improve their lubricity (Derwent abstract), it would have been obvious to have used treatment sulphiding times in the claimed range with a reasonable expectation of their being operable for improving lubricity of the parts.

The temperature range of EP 218916 of 140-30 °C is slightly above the upper claimed limit of 120 °C. However, because EP 218916 discloses at col. 1, lines 20-32 that it is desirable to minimize temperature for sulfurizing to prevent deformation, it would have been obvious to use temperatures in the claimed range to prevent deformation.

With respect to the limitation of a "pressure-rising rate up to  $10^{-3}$  Pa/h", EP 218916 discloses to maintain a pressure of about 1 Torr while sulfurizing and describes how that pressure is maintained by controlling the pumping speed and evaporation rate. It appears that the pressure is to be maintained constant which would include not raising the pressure more than  $10^{-3}$  Pa/h (i.e., the pressure rising rate at constant pressure should be as close to zero as possible).



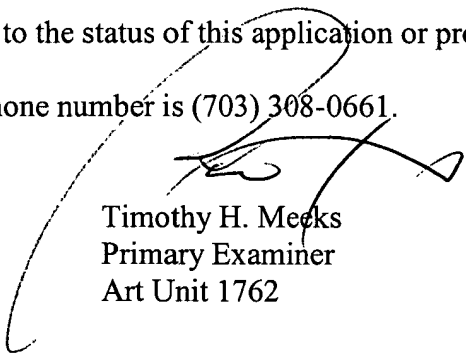
Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over EP 218916 in view of JP 51-49138 and FR 2688010 as applied above, and further in view of Niederhaeuser et al. (4,415,419).

The above references do not disclose supplying a molybdenum disulfide coating. However, because Niederhauser et al. disclose that providing molybdenum disulfide coatings on metal sulfide substrates improves lubricity of the parts (abstract, col. 1, lines 5-10), it would have been obvious to provide a molybdenum disulfide coating for providing improved lubricity of the parts.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy H. Meeks whose telephone number is (703) 308-3816. The examiner can normally be reached on Mon., Tues., Thurs.(6-6:30), Fri.(6:30-10:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (703) 308-2333. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Timothy H. Meeks  
Primary Examiner  
Art Unit 1762

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